Final

Site Investigation Report
Former Fuel Yard, Parcel 131(7)

Fort McClellan
Calhoun County, Alabama

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK05, IT Corporation (IT) completed a site investigation (SI) at the Former Fuel Yard, Parcel 131(7) at Fort McClellan (FTMC) in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the Former Fuel Yard, Parcel 131(7) and, if present, whether the concentrations would present an unacceptable risk to human health or the environment. The SI at the Former Fuel Yard, Parcel 131(7), consisted of the sampling and analyses of three surface soil samples, three subsurface soil samples, and one groundwater sample. In addition, a groundwater monitoring well was installed in the residuum groundwater zone to facilitate groundwater sample collection and provide site-specific geological and hydrogeological characterization information.

The analytical results from the SI indicate that metals, volatile organic compounds, and semivolatile organic compounds were detected in the environmental media sampled. To evaluate whether the detected constituents pose an unacceptable risk to human health or the environment, the analytical results were compared to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC.

The potential impact to human receptors is expected to be minimal. Aluminum, arsenic, and iron were detected in surface soils at concentrations exceeding residential human health SSSLs but were less than background screening values. Aluminum and iron were detected in subsurface soils at concentrations exceeding residential human health SSSLs and background screening values. However, these metals concentrations were within the range of background concentrations. Antimony, iron, and manganese concentrations in the groundwater sample collected exceeded residential human health SSSLs; however, the concentrations were below background screening values. Given the low concentrations detected and the limited impacted area, the metals detected in surface, soils, subsurface soils, and groundwater do not pose an unacceptable risk to human health.

Although several metals were detected in surface soils at concentrations that exceeded their ESVs, with the exception of selenium, these concentrations were less than background screening values. A comparison of the selenium concentrations of surface soil samples from the Former Fuel Yard, Parcel 131(7), to the one background sample that contains selenium, indicates that the selenium concentrations from Parcel 131(7) are within the same order of magnitude as

background. Substantial ecological habitat is not present at this parcel because of its small size and, thus, the potential threat to ecological receptors is minimal.

Based on the results of the SI, past operations at the Former Fuel Yard, Parcel 131(7), do not appear to have adversely impacted the environment. The metals and organic compounds detected in site media do not pose an unacceptable risk to human health or the environment. Therefore, IT Corporation recommends "No Further Action" and unrestricted land reuse at the Former Fuel Yard, Parcel 131(7).

1.0 Introduction

The U.S. Army has selected Fort McClellan (FTMC) located in Calhoun County, Alabama, for closure by the Base Realignment and Closure (BRAC) Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act, Public Law 101-510, established the process by which U.S. Department of Defense (DOD) installations would be closed or realigned. The BRAC Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. The U.S. Army is conducting environmental studies of the impact of suspected contaminants at parcels at FTMC under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE contracted with IT Corporation (IT) to perform the site investigation (SI) at the Former Fuel Yard, Parcel 131(7), under Contract Number DACA21-96-D-0018, Task Order CK05.

This SI report presents specific information and results compiled from the SI, including field sampling and analysis and monitoring well installation activities, conducted at the Former Fuel Yard, Parcel 131(7).

1.1 Project Description

The Former Fuel Yard was identified as an area to be investigated prior to property transfer. The Former Fuel Yard, Parcel 131(7), was identified as a Category 7 site in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 sites are areas that are not evaluated and/or that require further evaluation.

A site-specific field sampling plan (SFSP) attachment and a site-specific safety and health plan (SSHP) attachment were finalized in November 1998 (IT,1998a). The SFSP and SSHP provide technical guidance for sample collection and analysis at the Former Fuel Yard, Parcel 131(7). The SFSP was used in conjunction with the SSHP as attachments to the installation-wide work plan (IT, 1998b) and the installation-wide sampling and analysis plan (SAP) (IT, 2000a). The SAP includes the installation-wide safety and health plan and quality assurance plan.

The SI included field work to collect three surface soil samples, three subsurface soil samples, and one groundwater sample to determine whether potential site-specific chemicals are present at the Former Fuel Yard, Parcel 131(7).

1.2 Purpose and Objectives

The SI program was designed to collect data from site media and provide a level of defensible data and information in sufficient detail to determine whether chemical constituents are present at the Former Fuel Yard, Parcel 131(7), at concentrations that would present an unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0 are based on the comparison of the analytical results to human health site-specific screening levels (SSSL) and ecological screening values (ESV) and background screening values for FTMC. The SSSLs and ESVs were developed by IT as part of the human health and ecological risk evaluations associated with SIs being performed under the BRAC Environmental Restoration Program at FTMC. The SSSLs and ESVs are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). Background metals screening values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation [SAIC], 1998).

Based on the conclusions presented in this SI report, the BRAC Cleanup Team will decide to propose "No Further Action" at the site or to conduct additional work at the site.

1.3 Site Description and History

The Former Fuel Yard, Parcel 131(7), is located in the east central portion of the Main Post, near the junction of 18th Street and 2nd Avenue (Figure 1-1). This site is adjacent to 18th Street on the western side of an unnamed paved road that parallels 2nd Avenue. Aerial photographs (U.S. Environmental Protection Agency [EPA], 1990) indicate this area was used for coal storage during the years 1949, 1954, and 1961. The General Topographical and Location Map, Office of the Construction Quartermaster, 1919, identifies a former fuel yard at a location immediately south and west of the Quartermaster's Gasoline Storage Area, Parcel 130(7). The map presents the information inexactly, and, therefore the location plotted on the EBS maps (ESE, 1998) is approximate and the parcel boundary is unknown (Figure 1-2). Based on the EBS parcel boundary, the parcel site is slightly less than one-tenth of an acre. It is also unknown if other types of fuel (besides the coal shown in the aerial photographs) were stored in this area.

Ground surface at the site slopes to the west and there are not any significant natural drainage features in the vicinity. The nearest natural drainage (an intermittent stream) is located approximately 700 feet to the west, and flows to the northwest and eventually into Cave Creek.

2.0 Previous Investigations

An EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The study was to identify sites that, based on available information, have no history of contamination and comply with DOD guidance on fast track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by seven criteria:

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas)

2. Areas where only release or disposal of petroleum products has occurred

3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response

4. Areas of release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken

5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken

6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented

7. Areas that are not evaluated or require further evaluation.

The EBS was conducted in accordance with the Community Environmental Response Facilitation Act (CERFA) (CERFA-Public Law 102-426) protocols and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, the Alabama Department of Environmental Management (ADEM), EPA Region IV, and Calhoun County, as well as a database search of Comprehensive Environmental Response, Compensation, and Liability Act-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historic maps and aerial photographs were reviewed to document historic land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific

property parcels. The Former Fuel Yard, Parcel 131(7), was identified as a Category 7 CERFA site: areas that are not evaluated or require further evaluation. Previous studies to document site environmental conditions have not been conducted.

3.0 Current Site Investigation Activities

This chapter describes the SI activities conducted by IT at the Former Fuel Yard, Parcel 131(7), including environmental sampling and analysis and monitoring well installation activities.

3.1 Environmental Sampling

The environmental sampling performed during the SI at the Former Fuel Yard, Parcel 131(7), included the collection of surface soil samples, subsurface soil samples, and a groundwater sample for chemical analyses. The sample locations were determined by observing site physical characteristics noted during a site visit, and by reviewing historical documents pertaining to activities conducted at the site. The sample locations, media, and rationale are summarized in Table 3-1. Sample locations are shown on Figure 3-1. Samples were submitted for laboratory analyses of site-related parameters listed in Section 3.3.

3.1.1 Surface Soil Sampling

Surface soil samples were collected from three locations at the Former Fuel Yard, Parcel 131(7). Soil sampling locations and rationale are presented in Table 3-1. Sampling locations are shown on Figure 3-1. Sample designations and quality assurance/quality control (QA/QC) samples are listed in Table 3-2. Soil sampling locations were determined in the field by the on-site geologist based on the sampling rationale, site topography, and drainage features.

Sample Collection. Surface soil samples were collected from the upper 1 foot of soil with a 3-inch diameter stainless-steel hand auger using the methodology specified in Section 4.9.1.1 of the SAP (IT, 2000a). Surface soil samples were collected by first removing surface debris, such as rocks and vegetation, from the immediate sample area. The soil was then collected with the sampling device and screened with a photoionization detector (PID) in accordance with Section 4.7.1.1 of the SAP (IT, 2000a). Samples for volatile organic compound (VOC) analyses were collected directly from the sampler with three EnCore® samplers. The remaining soil was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.3. Sample collection logs are included in Appendix A.

3.1.2 Subsurface Soil Sampling

Subsurface soil samples were collected from three soil borings at the Former Fuel Yard, Parcel 131(7), as shown on Figure 3-1. Subsurface sampling locations and rationale are presented in Table 3-1. Subsurface soil sample designations, depths, and QA/QC samples are listed in Table 3-2. Soil boring sampling locations were determined in the field by the on-site geologist based

Table 3-1

Sampling Locations And Rationale
Former Fuel Yard, Parcel 131(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
FTA-131-GP01	Surface Soil Subsurface Soil	Surface soil and subsurface soil samples were collected east of the parcel to determine if potential site-specific chemicals (PSSC) are present in site media.
FTA-131-GP02	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil, and groundwater samples were collected southwest (downgradient) of the parcel boundary to determine if PSSCs are present in site media.
FTA-131-GP03	Surface Soil Subsurface Soil	Surface soil and subsurface soil samples were collected northwest of the parcel to determine if PSSCs are present in site media.

Table 3-2

Surface Soil and Subsurface Soil Sample Designations and QA/QC Samples
Former Fuel Yard, Parcel 131(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
FTA-131-GP01	FTA-131-GP01-SS-DK0001-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals
	FTA-131-GP01-DS-DK0002-REG	8-12				
FTA-131-GP02	FTA-131-GP02-SS-DK0003-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals
	FTA-131-GP02-DS-DK0004-REG	8-12	FTA-131-GP02-DS-DK0005-FD	FTA-131-GP02-DS-DK0006-FS		
FTA-131-GP03	FTA-131-GP03-SS-DK0007-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals
	FTA-131-GP03-DS-DK0008-REG	8-12			FTA-131-GP03-DS-DK0008-MS FTA-131-GP03-DS-DK0008-MSD	

FD - Field duplicate.
FS - Field split.
ft bgs - feet below ground surface.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

on the sampling rationale and site topography. IT contracted TEG, Inc., a direct-push technology subcontractor, to assist in subsurface soil sample collection.

Sample Collection. Subsurface soil samples were collected from soil borings at depths greater than 1 foot below ground surface (bgs) in the unsaturated zone. The soil borings were advanced and soil samples collected using the direct-push sampling procedures specified in Section 4.9.1.1 of the SAP (IT, 2000a). Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.3.

Subsurface soil samples were collected continuously to 12 feet bgs or until direct-push sampler refusal was encountered. Samples were field screened using a PID in accordance with Section 4.7.1.1 of the SAP (IT, 2000a) to measure for volatile organic vapors. The sample showing the highest reading was selected and sent to the laboratory for analysis; however, at those locations where PID readings were not greater than background, the deepest sample interval above groundwater was submitted for analyses. Samples to be analyzed for VOCs were collected directly from the sampler with three EnCore® samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. Samples submitted for laboratory analyses are summarized in Table 3-2. The on-site geologist constructed a detailed lithologic log. The lithological log for each borehole is included in Appendix B.

At the completion of soil sampling, boreholes were abandoned with bentonite chips and hydrated with potable water following borehole abandonment procedures summarized in Appendix B of the SAP (IT, 2000a).

3.1.3 Well Installation

One temporary well was installed in the residuum groundwater zone at the Former Fuel Yard, Parcel 131(7), to collect a groundwater sample for laboratory analyses. The well/groundwater sample location is shown on Figure 3-1. Table 3-3 summarizes the construction details of the temporary well installed at the Former Fuel Yard, Parcel 131(7). The well construction log is included in Appendix B.

IT contracted Miller Drilling, Inc., to install the temporary well with a hollow-stem auger rig at the well/groundwater sample location shown on Figure 3-1. The well was installed following procedures outlined in Section 4.7 and Appendix C of the SAP (IT, 2000a). The borehole at this location was advanced with a 4.25-inch inside diameter (ID) hollow-stem auger from ground

Table 3-3

Temporary Well Construction Summary
Former Fuel Yard, Parcel 131(7)
Fort McClellan, Calhoun County, Alabama

Temporary Well	Northing	Easting	Ground Elevation (ft msl)	TOC Elevation (ft msl)	Well Depth (ft bgs)	Screen Length (ft bgs)	Screen Interval (ft bgs)	Well Material
FTA-131-GP02	1172857.904	672758.294	791.36	793.21	19	15	3.75 - 18.75	2" ID Sch. 40 PVC

Temporary wells installed using hollow-stem auger.
Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum 1983.
Elevations were referenced to the North American Vertical Datum of 1988.
2" ID Sch. 40 PVC - 2-inch inside diameter, Schedule 40, polyvinyl chloride.
bgs - Below ground surface.
ft - Feet.
msl - Mean sea level.
TOC - Top of casing.

surface to the first water-bearing zone in residuum at the well location. A hollow-stem auger drill rig was used to install the well because the effort to install the well using direct-push technology was unsuccessful. The direct-push rig encountered refusal before residuum groundwater was reached. The borehole was augered to the depth of direct-push sampler refusal and samples were collected at the depth of direct-push refusal to the bottom of the borehole. A 2-foot long, 2-inch ID carbon steel split-spoon sampler was driven at 5-foot intervals to collect residuum for observing and describing lithology. Where split-spoon refusal was encountered, the auger was advanced until the first water-bearing zone was encountered. The on-site geologist logging the auger borehole at the Former Fuel Yard, Parcel 131(7), continued the detailed lithological log for the borehole from the depth of split-spoon refusal to the bottom of the auger borehole by logging the auger drill cuttings. The drill cuttings were logged to determine lithologic changes and the approximate depth of groundwater encountered during drilling. This information was used to determine the optimal placement of the monitoring well screen interval and to provide site-specific geologic and hydrogeologic information. The lithological log for the borehole is included in Appendix B.

Upon reaching the target depth, a 15-foot length of 2-inch ID, 0.010-inch factory slotted, Schedule 40 polyvinyl chloride (PVC) screen with a 3-inch end cap was placed through the auger to the bottom of the borehole. The screen and end cap were attached to 2-inch ID, flush-threaded Schedule 40 PVC riser. A number 1 filter sand (environmentally safe, clean, fine sand, sieve size 20 to 40) was tremied around the well screen to approximately 2 feet above the top of the well screen as the augers were removed. The well was surged approximately 10 minutes, using a solid PVC surge block, or until no more settling of the filter sand occurred inside the borehole. A bentonite seal, consisting of approximately 2 feet of bentonite chips, was placed immediately on top of the filter sand and hydrated with potable water. The bentonite seal placement and hydration followed procedures in Appendix C of the SAP (IT, 2000a). A locking well cap was placed on the PVC well casing. The temporary well surface completion included attaching plastic sheeting around the PVC riser using duct tape. Additionally, sand bags were used to secure the sheeting to the ground surface around the temporary well.

The temporary well was developed by surging and pumping with a 2-inch diameter submersible pump in accordance with methodology outlined in Section 4.8 and Appendix C of the SAP (IT, 2000a). The submersible pump being used for well development was moved in an up-and-down fashion to encourage any residual well installation materials to enter the well. These materials were then pumped out of the well in order to reestablish the natural hydraulic flow conditions. Development was performed until the water turbidity was less than or equal to 20 nephelometric units or for a maximum of 4 hours. The well development log is included in Appendix C.

3.1.4 Water Level Measurements

The depth to groundwater was measured in all temporary, permanent, and existing wells installed at FTMC in March 2000 following procedures outlined in Section 4.18 of the SAP (IT, 2000a). Depth to groundwater was measured with electronic water level meters. Each meter probe and cable were cleaned between use at each well following decontamination methodology presented in Section 4.10 of the SAP (IT, 2000a). Measurements were referenced to the top of each well casing. A summary of groundwater level measurements is presented in Table 3-4.

3.1.5 Groundwater Sampling

Groundwater was sampled from the temporary well installed at location FTA-131-GP02 at the Former Fuel Yard, Parcel 131(7). The temporary well location is shown on Figure 3-1. The groundwater sampling location and rationale are listed in Table 3-1. The groundwater sample designation and QA/QC samples are listed in Table 3-5.

Sample Collection. Groundwater sampling was performed at the temporary well location following procedures outlined in Section 4.9.1.4 of the SAP (IT, 2000a). Groundwater was sampled from the temporary well after purging a minimum of three well volumes and after field parameters, including temperature, pH, specific conductivity, oxidation-reduction potential, and turbidity, stabilized. Purging and sampling were performed with a peristaltic pump equipped with Teflon™ tubing. Field parameters were measured using a calibrated water quality meter. Field parameter readings are summarized in Table 3-6. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-5 using the methods outlined in Section 3.3.

3.2 Surveying of Sample Locations

Sample locations were surveyed using global positioning system survey techniques described in Section 4.3 of the SAP (IT, 2000a), and conventional civil survey techniques described in Section 4.19 of the SAP (IT, 2000a). Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum, 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix D.

Table 3-4

Groundwater Elevations
Former Fuel Yard, Parcel 131(7) and Vicinity
Fort McClellan, Calhoun County, Alabama

Well Location	Date	Depth to Water (ft BTOC)	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Groundwater Elevation (ft msl)
FTA-131-GP02	13-Mar-00	3.01	793.21	791.36	790.20
FTA-130-GP03	13-Mar-00	4.55	803.99	802.66	799.44
FTA-130-GP04	13-Mar-00	2.98	797.32	795.74	794.34
FTA-149-GP12	13-Mar-00	6.25	789.93	788.04	783.68
PPMP-85-GP04(W)	13-Mar-00	8.18	798.25	796.07	790.07
PPMP-85-GP05	13-Mar-00	7.03	800.56	798.10	793.53

Elevations were referenced to the North American Vertical Datum of 1988.
BTOC - Below top of casing.
ft - Feet.
msl - mean sea level.

Table 3-5

Groundwater Sample Designation and QA/QC Samples
Former Fuel Yard, Parcel 131(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	QA/QC Samples			Analytical Suite
		Field Duplicates	Field Splits	MS/MSD	
FTA-131-GP02	FTA-131-GP02-GW-DK3001-REG	FTA-131-GP02-GW-DK3002-FD	FTA-131-GP02-GW-DK3003-FS	FTA-131-GP02-GW-DK3001-MS FTA-131-GP02-GW-DK3001-MSD	TCL VOCs, TCL SVOCs, TAL Metals

Groundwater samples were collected from the approximate midpoint of the saturated screened interval of the monitoring well.

FD - Field duplicate.
FS - Field split.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 3-6

Groundwater Field Parameters
Former Fuel Yard, Parcel 131(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Date	Media	Specific Conductivity[a] (mS/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (^{o}C)	Turbidity (NTU)	pH (SU)
FTA-131-GP02	26-Jan-99	GW	0.0445	0.37	204	18.64	43.2	6.9

[a]Specific conductivity values standardized to millisiemens per centimeter.
^{o}C - Degrees celsius.
GW - Groundwater.
mS/cm - Millisiemens per centimeter.
mV - Millivolts.
mg/L - Milligrams per liter.
NTU - Nephelometric turbidity unit.
ORP - Oxidation-reduction potential.
SU - Standard unit.

3.3 Analytical Program

Samples collected during the SI were analyzed for various chemical parameters. The specific suite of analyses performed was based on the potential site-specific chemicals historically at the site and EPA, ADEM, FTMC, and USACE requirements. Samples collected from the Former Fuel Yard, Parcel 131(7), were analyzed for the following parameters:

- Target Compound List (TCL) VOCs – EPA Method 5035/8260B
- TCL Semivolatile Organic Compounds (SVOC) – EPA Method 8270C
- Target Analyte List Metals – EPA Method 6010B/7000

The samples were analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Table 6-1 in Appendix B of the SAP (IT, 2000a). Data were reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of Appendix B of the SAP [IT, 2000a]). Chemical data were reported via hard copy data packages by the laboratory using Contract Laboratory Program-like forms. These packages were validated in accordance with EPA National Functional Guidelines by Level III criteria. A summary of validated data is included in Appendix E. The Data Validation Summary Report is included as Appendix F.

3.4 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping followed requirements specified in Section 4.13.2 of the SAP (IT, 2000a). Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SI are listed in Section 5.0, Table 5-1, of Appendix B of the SAP (IT, 2000a). Sample documentation and chain-of-custody records were recorded as specified in Section 4.13 of the SAP (IT, 2000a).

Completed analysis request and chain-of-custody records (Appendix A) were secured and included with each shipment of sample coolers to Quanterra Environmental Services in Knoxville, Tennessee. Split samples were shipped to USACE South Atlantic Division Laboratory in Marietta, Georgia.

3.5 Investigation-Derived Waste Management and Disposal

Investigation-derived waste (IDW) was managed and disposed as outlined in Appendix D of the SAP (IT, 2000a). The IDW generated from the field sampling at the Former Fuel Yard, Parcel 131(7), was segregated as follows:

- Drill cuttings
- Purge water from well development and sampling activities, and decontamination fluids, and
- Personal protective equipment (PPE).

Solid IDW was stored inside the fenced area surrounding Buildings 335 and 336 in lined rolloff bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure analyses. Based on the results, drill cuttings and PPE generated during the SI at the Former Fuel Yard, Parcel 131(7), were disposed as non-regulated waste at the Industrial Waste Landfill on the Main Post of FTMC.

Liquid IDW was contained in the existing 20,000-gallon sump associated with the Building T-338 vehicle wash rack. Liquid IDW was characterized by VOC, SVOC, and metals analyses. Based on the analyses, liquid IDW was discharged as non-regulated waste to the FTMC wastewater treatment plant on the Main Post.

3.6 Variances/Nonconformances

One variance to the SFSP was recorded during completion of the SI at the Former Fuel Yard, Parcel 131(7). The variance did not alter the intent of the investigation or the sampling rationale presented in Table 4-2 of the SFSP (IT, 2000a). The variance to the SFSP is summarized in Table 3-7 and included in Appendix G.

There were not any nonconformances to the SFSP recorded during completion of the SI at the Former Fuel Yard, Parcel 131(7).

3.7 Data Quality

The field sample results data are presented in tabular form in Appendix E. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI work plan; the FTMC SAP and installation-wide quality assurance plan, and standard, accepted methods and procedures. Sample collection logs pertaining to the collection of these samples were reviewed and organized for this report and are included in Appendix A. As discussed in Section 3.6, one variance was recorded. However, this variance did not impact the usability of the data.

Table 3-7

Variance to the Site-Specific Field Sampling Plan
Former Fuel Yard, Parcel 131(7)
Fort McClellan, Calhoun County, Alabama

Variance to the SFSP	Justification for Variance	Impact to Site Investigation
The temporary well at sample location FTA-131-GP02 was installed using hollow-stem auger drilling methods. The temporary well at this sample location was proposed to be installed using direct push technology (DPT).	The hollow-stem auger rig was used to install the temporary well at the sample location where DPT encountered refusal prior to encountering groundwater. The intent was to drill deeper than DPT refusal to install a well into the upper (first) groundwater-bearing zone at locations proposed in the site-specific field sampling plan (SFSP).	The variance assured that a groundwater sample could be collected from the proposed groundwater sample location in the SFSP.

Data Validation. A complete (100 percent) Level III data validation effort was performed on the reported analytical data. Appendix F consists of a data validation summary report that was prepared to discuss the validation results. Selected results were rejected or otherwise qualified based on the implementation of accepted data validation procedures and practices during the validation effort. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC IT Environmental Management System™ database for tracking and reporting. The qualified data were used in the comparison to the SSSLs and ESVs developed by IT. Rejected data (assigned an "R" qualifier) were not used in the comparison to the SSSLs and ESVs. The data presented in this report, except where qualified, meet the principle data quality objective for this SI.

4.0 Site Characterization

Subsurface investigations performed at the Former Fuel Yard, Parcel 131(7), provided soil, geologic, and groundwater data. These data were used to characterize the geology and hydrogeology of the site.

4.1 Regional and Site Geology

4.1.1 Regional Geology

Calhoun County includes parts of two physiographic provinces, the Piedmont Upland Province and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold and thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold and thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992), and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group is comprised of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984), but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish-gray siltstone and mudstone. Massive to laminated, greenish-gray and black mudstone makes up the Nichols Formation with thin interbeds of

siltstone and very fine-grained sandstone (Szabo et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies appear to dominate the unit and consists primarily of coarse-grained, vitreous quartzite, and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consists of sandy and micaceous shale and silty, micaceous mudstone which are locally interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation northeast, east and southwest of the Main Post and consists of interlayered bluish-gray or pale yellowish-gray sandy dolomitic limestone and siliceous dolomite with coarsely crystalline porous chert (Osborne et al., 1989). A variegated shale and clayey silt have been included within the lower part of the Shady Dolomite (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post as mapped by Warman and Causey (1962) and Osborne and Szabo (1984), and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome Formation consists of variegated thinly interbedded grayish-red-purple mudstone, shale, siltstone, and greenish-red and light gray sandstone, with locally occurring limestone and dolomite. The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962), (Osborne and Szabo, 1984) and the northern portion of the Main Post (Osborne et al. 1997). The Conasauga Formation is composed of dark-gray, finely to coarsely crystalline medium- to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989).

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weathers to a chert residuum

(Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone is comprised of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped together as undifferentiated at FTMC and other parts of Calhoun County. The Athens Shale overlies the Ordovician limestone units. The Athens Shale consists of dark-gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur within an eroded "window" in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post.

Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of various siltstones, sandstones, shales, dolomites and limestones, and are mapped as one, undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of interbedded red sandstone, siltstone, and shale with greenish-gray to red silty and sandy limestone.

The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with shale interbeds, dolomudstone, and glauconitic limestone (Szabo et al., 1988). This unit locally occurs in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark- to light-gray limestone with abundant chert nodules and greenish-gray to grayish-red phosphatic shale with increasing amounts of calcareous chert toward the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale on the basis of fossil data.

The Jacksonville Thrust Fault is the most significant structural geologic feature in the vicinity of FTMC, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama and Piedmont, Alabama. The fault is interpreted as a major splay of the Pell City Fault (Osborne and Szabo, 1984). The Ordovician sequence comprising the Eden thrust sheet is exposed at FTMC through an eroded "window" or "fenster" in the overlying thrust sheet. Rocks within the window display complex folding with the folds being overturned, and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formation, north by the Conasauga Formation, northeast, east, and southwest by the Shady Dolomite, and southeast and southwest by the Chilhowee Group (Osborne et al., 1997).

4.1.2 Site Geology

Soils underlying the Former Fuel Yard, Parcel 131(7), are mapped as Rarden Series (U.S. Department of Agriculture, 1961). These soils are characterized as silty clay loam with concretions and sandstone fragments and a thin solum. The Rarden series soils are developed from the residuum of shale and fine-grained platy sandstone or limestone.

Bedrock beneath the Main Post of FTMC, including the Former Fuel Yard, Parcel 131(7), is mapped as Ordovician limestone and shale formations, including the Newala and Longview Limestones, Lenoir Limestone, Athens Shale, Little Oak Limestone, and Chickamauga Limestone. These units occur within the eroded "window" in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post. The Mississippian Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, was reassigned to the Ordovician Athens Shale by Osborne and Szabo (1983, 1984) based on fossil data.

Based on direct-push and hollow-stem auger boring data collected during the SI, sediments beneath the Former Fuel Yard, Parcel 131(7), consist of predominantly silt and clay overlying weathered shale. The weathered shale is encountered at about 10 to 12 feet bgs at the Former Fuel Yard, Parcel 131(7). A geologic cross section was constructed with boring log data from Parcels 130(7) and 131(7). The cross section location is shown on Figure 4-1 and the geologic cross section is presented on Figure 4-2.

4.2 Site Hydrology

4.2.1 Surface Hydrology

Precipitation in the form of rainfall averages about 54 inches annually in Anniston, Alabama, with infiltration rates annually exceeding evapotranspiration rates. The major surface water features at the Main Post of FTMC include Remount Creek, Cane Creek, and Cave Creek. These waterways flow in a general northwest to westerly direction towards the Coosa River on the western boundary of Calhoun County.

Surface runoff at the Former Fuel Yard follows site topography and generally flows to the west toward an unnamed intermittent stream. The intermittent stream flows to the northwest and eventually into Cave Creek.

4.2.2 Hydrogeology

During boring and well installation activities, groundwater was encountered at 13 feet bgs at sample location FTA-131-GP02. The borings at sample locations FTA-131-GP01 and FTA-131-GP03 were completed to 12 feet bgs and groundwater was not encountered in either boring. Static groundwater levels were measured in the temporary well at FTA-131-GP02 and in temporary wells installed at adjacent parcels on March 13, 2000. Table 3-4 summarizes measured groundwater elevations at the temporary well at Parcel 131(7) and adjacent parcels. Groundwater elevations were calculated by measuring the depth to groundwater relative to the surveyed top-of-casing elevations. A groundwater elevation map constructed from the March 2000 data is shown on Figure 4-3. Based on the groundwater levels, horizontal groundwater flow is to the west, towards Cave Creek, following the general slope of the topography, with a gradient ranging from approximately 0.03 to 0.05 feet per foot.

5.0 Summary of Analytical Results

The results of the chemical analyses of samples collected at the Former Fuel Yard, Parcel 131(7), indicate that metals, VOCs, and SVOCs have been detected in the various site media. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC.

Metals concentrations exceeding the SSSLs and ESVs were subsequently compared to background metals screening values (background concentrations) (SAIC, 1998) to determine if the metals concentrations are within natural background concentrations. Summary statistics for background metals samples collected at FTMC (SAIC, 1998) are included in Appendix H.

Six compounds were quantified by both SW-846 Method 8260B (as VOC) and Method 8270C (as SVOC), including 1.2.4-trichlorobenzene, 1,4-dichlorobenzene, 1.3-dichlorobenzene, 1.2-dichlorobenzene, hexachlorobutadiene, and naphthalene. Method 8260B yields a reporting limit (RL) of 0.005 milligrams per kilogram (mg/kg), while Method 8270C has a RL of 0.330 mg/kg, which is typical for a soil matrix sample. Because of the direct nature of the Method 8260B analysis and its resulting lower RL, this method should be considered superior to Method 8270C when quantifying low levels (0.005 to 0.330 mg/kg) of these compounds. Method 8270C and its associated methylene chloride extraction step is superior, however, when dealing with samples than contain higher concentrations (greater than 0.330 mg/kg) of these compounds. Therefore, all data were considered and none were categorically excluded. Data validation qualifiers were helpful in evaluating the usability of data, especially if calibration, blank contamination, precision, or accuracy indicator anomalies were encountered. The validation qualifiers and concentrations reported (e.g., whether concentrations were less than or greater than 0.330 mg/kg) were used to determine which analytical method was likely to return the more accurate result.

The following sections and Tables 5-1 through 5-3 summarize the results of the comparison of detected constituents to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix E.

Table 5-1

Surface Soil Analytical Results
Former Fuel Yard, Parcel 131(7)
Fort McClellan, Calhoun County, Alabama

			Human Health Screening Values Resident		Ecological Screening Values		FTA-131 FTA-131-GP01 DK0001 3-Nov-98 Start Depth = 0 End Depth = 1					FTA-131 FTA-131-GP02 DK0003 4-Nov-98 Start Depth = 0 End Depth = 1				
Chemical	Units	Bkg[a]	Noncancer SSSL	Cancer SSSL	USEPA Region IV Values[b]	Supp. Values	Result	ValQual	>Bkg	>SSSL	>ESV	Result	ValQual	>Bkg	>SSSL	>ESV
Metals																
Aluminum	mg/kg	1.63E+04	7.80E+03	NA	5.00E+01	- -	7.40E+03				YES	8.04E+03			YES	YES
Arsenic	mg/kg	1.37E+01	2.34E+00	4.26E-01	1.00E+01	- -	4.10E+00			YES		4.20E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	NA	1.65E+02	- -	5.50E+01					6.43E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	NA	1.10E+00	- -	8.00E-01					7.70E-01				
Calcium	mg/kg	1.72E+03	Essential Nutrient		no data	no data	5.16E+03		YES			1.63E+03				
Chromium	mg/kg	3.70E+01	2.32E+01	NA	4.00E-01	- -	1.74E+01				YES	1.84E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	NA	2.00E+01	- -	6.70E+00	J				8.40E+00	J			
Copper	mg/kg	1.27E+01	3.13E+02	NA	4.00E+01	- -	8.70E+00					1.06E+01				
Iron	mg/kg	3.42E+04	2.34E+03	NA	2.00E+02	- -	2.02E+04			YES	YES	2.29E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	NA	5.00E+01	- -	1.80E+01	J				1.90E+01	J			
Magnesium	mg/kg	1.03E+03	Essential Nutrient		no data	4.40E+05	1.28E+03		YES			7.67E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	NA	1.00E+02	- -	2.07E+02				YES	2.12E+02				YES
Mercury	mg/kg	8.00E-02	2.33E+00	NA	1.00E-01	- -	ND					4.10E-02				
Nickel	mg/kg	1.03E+01	1.54E+02	NA	3.00E+01	- -	ND					5.20E+00				
Selenium	mg/kg	4.80E-01	3.91E+01	NA	8.10E-01	- -	1.40E+00	J	YES		YES	1.50E+00	J	YES		YES
Vanadium	mg/kg	5.88E+01	5.31E+01	NA	2.00E+00	- -	1.19E+01				YES	1.28E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	NA	5.00E+01	- -	2.82E+01	J				2.95E+01	J			
Volatile Organic Compounds																
1,2,4-Trimethylbenzene	mg/kg	NA	3.88E+02	NA	1.00E-01	- -	3.20E-03	J				ND				
1,2-Dimethylbenzene	mg/kg	NA	1.55E+04	NA	5.00E-02	- -	9.20E-03					ND				
1,3,5-Trimethylbenzene	mg/kg	NA	3.88E+02	NA	1.00E-01	- -	3.80E-03	J				ND				
2-Butanone	mg/kg	NA	4.66E+03	NA	no data	8.96E+01	ND					4.00E-03	B			
Acetone	mg/kg	NA	7.76E+02	NA	no data	2.50E+00	ND					5.60E-02	J			
Bromomethane	mg/kg	NA	1.09E+01	NA	no data	no data	ND					ND				
Ethylbenzene	mg/kg	NA	7.77E+02	NA	5.00E-02	- -	3.30E-03	J				ND				
m,p-Xylenes	mg/kg	NA	1.55E+04	NA	5.00E-02	- -	1.30E-02	J				ND				
Methylene chloride	mg/kg	NA	4.66E+02	8.41E+01	2.00E+00	- -	3.50E-03	B				4.50E-03	B			
p-Cymene	mg/kg	NA	1.55E+03	NA	no data	no data	ND					ND				
Toluene	mg/kg	NA	1.55E+03	NA	5.00E-02	- -	2.70E-03	J				ND				
Semivolatile Organic Compounds																
bis(2-Ethylhexyl)phthalate	mg/kg	NA	1.56E+02	4.52E+01	no data	9.26E-01	1.50E-01	B				6.10E-02	J			

Table 5-1

Surface Soil Analytical Results
Former Fuel Yard, Parcel 131(7)
Fort McClellan, Calhoun County, Alabama

			Human Health Screening Values Resident		Ecological Screening Values		FTA-131 FTA-131-GP03 DK0007 4-Nov-98 Start Depth = 0 End Depth = 1				
Chemical	Units	Bkg[a]	Noncancer SSSL	Cancer SSSL	USEPA Region IV Values[b]	Supp. Values	Result	ValQual	>Bkg	>SSSL	>ESV
Metals											
Aluminum	mg/kg	1.63E+04	7.80E+03	NA	5.00E+01	- -	5.35E+03				YES
Arsenic	mg/kg	1.37E+01	2.34E+00	4.26E-01	1.00E+01	- -	3.10E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	NA	1.65E+02	- -	5.28E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	NA	1.10E+00	- -	5.40E-01				
Calcium	mg/kg	1.72E+03	Essential Nutrient		no data	no data	1.51E+03				
Chromium	mg/kg	3.70E+01	2.32E+01	NA	4.00E-01	- -	1.66E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	NA	2.00E+01	- -	7.10E+00	J			
Copper	mg/kg	1.27E+01	3.13E+02	NA	4.00E+01	- -	2.02E+01		YES		
Iron	mg/kg	3.42E+04	2.34E+03	NA	2.00E+02	- -	1.63E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	NA	5.00E+01	- -	1.67E+01	J			
Magnesium	mg/kg	1.03E+03	Essential Nutrient		no data	4.40E+05	ND				
Manganese	mg/kg	1.58E+03	3.63E+02	NA	1.00E+02	- -	3.46E+02				YES
Mercury	mg/kg	8.00E-02	2.33E+00	NA	1.00E-01	- -	3.70E-02				
Nickel	mg/kg	1.03E+01	1.54E+02	NA	3.00E+01	- -	ND				
Selenium	mg/kg	4.80E-01	3.91E+01	NA	8.10E-01	- -	1.10E+00	J	YES		YES
Vanadium	mg/kg	5.88E+01	5.31E+01	NA	2.00E+00	- -	1.01E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	NA	5.00E+01	- -	2.66E+01	J			
Volatile Organic Compounds											
1,2,4-Trimethylbenzene	mg/kg	NA	3.88E+02	NA	1.00E-01	- -	ND				
1,2-Dimethylbenzene	mg/kg	NA	1.55E+04	NA	5.00E-02	- -	ND				
1,3,5-Trimethylbenzene	mg/kg	NA	3.88E+02	NA	1.00E-01	- -	ND				
2-Butanone	mg/kg	NA	4.66E+03	NA	no data	8.96E+01	1.10E-02	B			
Acetone	mg/kg	NA	7.76E+02	NA	no data	2.50E+00	2.80E-01	J			
Bromomethane	mg/kg	NA	1.09E+01	NA	no data	no data	5.00E-03	B			
Ethylbenzene	mg/kg	NA	7.77E+02	NA	5.00E-02	- -	ND				
m,p-Xylenes	mg/kg	NA	1.55E+04	NA	5.00E-02	- -	ND				
Methylene chloride	mg/kg	NA	4.66E+02	8.41E+01	2.00E+00	- -	5.90E-03	B			
p-Cymene	mg/kg	NA	1.55E+03	NA	no data	no data	1.50E-02	J			
Toluene	mg/kg	NA	1.55E+03	NA	5.00E-02	- -	4.20E-03	J			
Semivolatile Organic Compounds											
bis(2-Ethylhexyl)phthalate	mg/kg	NA	1.56E+02	4.52E+01	no data	9.26E-01	ND				

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

[a] Bkg - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama,* July.

[b] Residential Human Health Site-Specific Screening Levels (SSSL) and Ecological Screening Values (ESV) as given in IT Corporation (2000b), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama,* July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).
J - Result is greater than method detection limit but less than or equal to reporting limit.
mg/kg - Milligrams per kilogram.
NA - Not available.
ND - Not Detected.
ValQual - Data Validation Qualifier.

Table 5-2

Subsurface Soil Analytical Results
Former Fuel Yard, Parcel 131(7)
Fort McClellan, Calhoun County, Alabama

			Human Health Screening Values Resident[b]		FTA-131 FTA-131-GP01 DK0002 3-Nov-98 Start Depth = 8 End Depth = 12				FTA-131 FTA-131-GP02 DK0004 4-Nov-98 Start Depth = 8 End Depth = 12			
			Noncancer	Cancer								
Chemical	**Units**	**Bkg[a]**	**SSSL**	**SSSL**	**Result**	**ValQual**	**>Bkg**	**>SSSL**	**Result**	**ValQual**	**>Bkg**	**>SSSL**
Metals												
Aluminum	mg/kg	1.36E+04	7.80E+03	NA	1.39E+04		YES	YES	1.79E+04		YES	YES
Arsenic	mg/kg	1.83E+01	2.34E+00	4.26E-01	1.04E+01			YES	5.50E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	NA	1.03E+02				1.39E+02			
Beryllium	mg/kg	8.60E-01	9.60E+00	NA	1.20E+00		YES		1.40E+00		YES	
Cadmium	mg/kg	2.20E-01	6.25E+00	NA	6.90E-01		YES		ND			
Calcium	mg/kg	6.37E+02	Essential Nutrient		4.98E+03		YES		3.17E+03	J	YES	
Chromium	mg/kg	3.83E+01	2.32E+01	NA	2.03E+01				2.62E+01			YES
Cobalt	mg/kg	1.75E+01	4.68E+02	NA	2.37E+01	J	YES		2.26E+01	J	YES	
Copper	mg/kg	1.94E+01	3.13E+02	NA	6.55E+01		YES		4.49E+01		YES	
Iron	mg/kg	4.48E+04	2.34E+03	NA	4.54E+04		YES	YES	4.66E+04		YES	YES
Lead	mg/kg	3.85E+01	4.00E+02	NA	2.26E+01	J			1.69E+01	J		
Magnesium	mg/kg	7.66E+02	Essential Nutrient		7.66E+03		YES		7.53E+03		YES	
Manganese	mg/kg	1.36E+03	3.63E+02	NA	8.26E+02			YES	5.10E+02			YES
Mercury	mg/kg	7.00E-02	2.33E+00	NA	5.00E-02				4.40E-02			
Nickel	mg/kg	1.29E+01	1.54E+02	NA	5.59E+01		YES		4.69E+01		YES	
Potassium	mg/kg	7.11E+02	Essential Nutrient		ND				7.04E+02			
Selenium	mg/kg	4.70E-01	3.91E+01	NA	2.40E+00	J	YES		1.30E+00	J	YES	
Zinc	mg/kg	3.49E+01	2.34E+03	NA	1.75E+02	J	YES		1.33E+02	J	YES	
Volatile Organic Compounds												
Acetone	mg/kg	NA	7.76E+02	NA	ND				ND			
Bromomethane	mg/kg	NA	1.09E+01	NA	ND				ND			
Methylene chloride	mg/kg	NA	4.66E+02	8.41E+01	3.80E-03	B			4.40E-03	B		
Semivolatile Organic Compounds												
bis(2-Ethylhexyl)phthalate	mg/kg	NA	1.56E+02	4.52E+01	1.30E-01	B			5.60E-02	J		

Table 5-2

Subsurface Soil Analytical Results
Former Fuel Yard, Parcel 131(7)
Fort McClellan, Calhoun County, Alabama

Chemical	Units	Bkg[a]	Human Health Screening Values Resident[b] Noncancer SSSL	Human Health Screening Values Resident[b] Cancer SSSL	FTA-131 FTA-131-GP03 DK0008 4-Nov-98 Start Depth = 8 End Depth = 12 Result	ValQual	>Bkg	>SSSL
Metals								
Aluminum	mg/kg	1.36E+04	7.80E+03	NA	1.46E+04		YES	YES
Arsenic	mg/kg	1.83E+01	2.34E+00	4.26E-01	6.80E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	NA	7.40E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	NA	1.10E+00		YES	
Cadmium	mg/kg	2.20E-01	6.25E+00	NA	6.80E-01		YES	
Calcium	mg/kg	6.37E+02	Essential Nutrient		3.01E+03		YES	
Chromium	mg/kg	3.83E+01	2.32E+01	NA	2.19E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	NA	2.38E+01	J	YES	
Copper	mg/kg	1.94E+01	3.13E+02	NA	4.83E+01		YES	
Iron	mg/kg	4.48E+04	2.34E+03	NA	4.30E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	NA	1.89E+01	J		
Magnesium	mg/kg	7.66E+02	Essential Nutrient		7.91E+03		YES	
Manganese	mg/kg	1.36E+03	3.63E+02	NA	6.28E+02			YES
Mercury	mg/kg	7.00E-02	2.33E+00	NA	4.80E-02			
Nickel	mg/kg	1.29E+01	1.54E+02	NA	5.03E+01		YES	
Potassium	mg/kg	7.11E+02	Essential Nutrient		ND			
Selenium	mg/kg	4.70E-01	3.91E+01	NA	1.80E+00	J	YES	
Zinc	mg/kg	3.49E+01	2.34E+03	NA	1.45E+02	J	YES	
Volatile Organic Compounds								
Acetone	mg/kg	NA	7.76E+02	NA	9.10E-03	B		
Bromomethane	mg/kg	NA	1.09E+01	NA	3.00E-03	B		
Methylene chloride	mg/kg	NA	4.66E+02	8.41E+01	3.40E-03	B		
Semivolatile Organic Compounds								
bis(2-Ethylhexyl)phthalate	mg/kg	NA	1.56E+02	4.52E+01	7.90E-02	J		

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

[a] Bkg - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama,* July.

[b] Residential Human Health Site-Specific Screening Levels (SSSL) as given in IT Corporation (2000b), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama,* July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).
J - Result is greater than method detection limit but less than or equal to reporting limit.
mg/kg - Milligrams per kilogram.
NA - Not available.
ND - Not detected.
ValQual - Data validation qualifier.

Table 5-3

Groundwater Analytical Results
Former Fuel Yard, Parcel 131(7)
Fort McClellan, Calhoun County, Alabama

Chemical	Units	Bkg[a]	Human Health Screening Values Resident[b] Noncancer SSSL	Human Health Screening Values Resident[b] Cancer SSSL	FTA-131 FTA-131-GP02 DK3001 26-Jan-99 Start Depth = 5.71 End Depth = 9.56 Result	ValQual	>Bkg	>SSSL
Metals								
Aluminum	mg/L	2.34E+00	1.56E+00	NA	7.69E-01			
Antimony	mg/L	3.19E-03	6.26E-04	NA	1.60E-03	B		YES
Barium	mg/L	1.27E-01	1.10E-01	NA	3.31E-02	J		
Beryllium	mg/L	1.25E-03	3.13E-03	NA	2.50E-04	B		
Calcium	mg/L	5.65E+01	NA	NA	1.67E+02		YES	
Chromium	mg/L	NA	4.69E-03	NA	2.40E-03	J		
Copper	mg/L	2.55E-02	6.26E-02	NA	2.66E-02	J	YES	
Iron	mg/L	7.04E+00	4.69E-01	NA	8.51E-01			YES
Magnesium	mg/L	2.13E+01	NA	NA	9.05E+01		YES	
Manganese	mg/L	5.81E-01	7.35E-02	NA	1.45E-01			YES
Potassium	mg/L	7.20E+00	NA	NA	2.38E+00	B		
Sodium	mg/L	1.48E+01	NA	NA	6.09E+01		YES	
Vanadium	mg/L	1.70E-02	1.10E-02	NA	6.70E-03	J		
Zinc	mg/L	2.20E-01	4.69E-01	NA	1.10E-02	B		
Semivolatile Organic Compounds								
Di-n-butyl-phthalate	mg/L	NA	1.48E-01	NA	1.20E-02			

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

[a] Bkg - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report* , *Fort McClellan, Alabama,* July.

[b] Residential Human Health Site-Specific Screening Levels (SSSL) as given in IT Corporation (2000b), *Final Human Health and Ecological Screening Values and PAH Background Summary Report* , *Fort McClellan, Calhoun County, Alabama* , July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).

J - Result is greater than method detection limit but less than or equal to reporting limit.

mg/L - Milligrams per liter.

NA - Not available.

ValQual - Data Validation Qualifier.

5.1 Surface Soil Sample Results

Three surface soil samples were collected for chemical analyses at the Former Fuel Yard, Parcel 131(7). Surface soil samples were collected from the upper 1 foot of soil at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs, ESVs, and background screening values, as presented in Table 5-1.

Metals. Seventeen metals were detected in surface soil samples collected at the Former Fuel Yard, Parcel 131(7). Aluminum (FTA-131-GP02), arsenic, (three locations), and iron (three locations) concentrations exceeded residential human health SSSLs. Of these metals, aluminum and iron also exceeded ESVs; however, none of these metals exceeded background screening values.

Chromium, manganese, selenium, and vanadium concentrations exceeded ESVs but were below residential human health SSSLs. Of these metals, only selenium exceeded the background screening value; however, the selenium concentrations in soil samples from the Former Fuel Yard, Parcel 131(7), are within the same order of magnitude as the background concentration (Appendix H).

Volatile Organic Compounds. Eleven VOCs were detected in surface soil samples collected the Former Fuel Yard, Parcel 131(7). The 2-butanone, bromomethane, and methylene chloride results were flagged with a "B" data qualifier indicating that these compounds were also detected in an associated laboratory or field blank. Ethyl benzene, 1,2,4-trimethylbenzene, 1,2-dimethylbenzene, 1,3,5-trimethylbenzene, and xylenes were detected at FTA-131-GP01. Bromomethane and p-cymene were detected only at FTA-131-GP03.

None of the VOCs detected in surface soils at the Former Fuel Yard, Parcel 131(7), was present at a concentration exceeding residential human health SSSLs or ESVs.

Semivolatile Organic Compounds. The SVOC bis(2-ethylhexyl)phthalate was detected at sample locations FTA-131-GP01 and FTA-131-GP02; however, the concentrations were below residential human health SSSLs and ESVs .

5.2 Subsurface Soil Sample Results

Three subsurface soil samples were collected for chemical analyses at the Former Fuel Yard, Parcel 131(7). Subsurface soil samples were collected at depths greater than 1 foot bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health

SSSLs and background screening values as presented in Table 5-2.

Metals. Eighteen metals were detected in subsurface soils at the Former Fuel Yard, Parcel 131(7). Aluminum (three locations), arsenic (three locations), chromium (one location), iron (three locations), and manganese (three locations) concentrations exceeded residential human health SSSLs; however, of these metals, only aluminum and iron concentrations exceeded background screening values. The aluminum and iron concentrations at the three subsurface sample locations at the Former Fuel Yard, Parcel 131(7), were within the range of background concentrations (Appendix H).

Volatile Organic Compounds. Acetone, bromomethane, and methylene chloride were detected in subsurface soil samples collected the Former Fuel Yard, Parcel 131(7). The VOC analytical results were flagged with a "B" data qualifier signifying that these compounds were also detected in an associated laboratory or field blank. Sample location FTA-131-GP03 contained all of the detected VOCs.

None of the VOCs detected in subsurface soils at the Former Fuel Yard, Parcel 131(7), was present at a concentration exceeding residential human health SSSLs.

Semivolatile Organic Compounds. The SVOC bis(2-ethylhexyl)phthalate was detected in each of the subsurface soil samples; however, concentrations were below residential human health SSSLs.

5.3 Groundwater Sample Results

One temporary monitoring well was sampled at the Former Fuel Yard, Parcel 131(7), at the location shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and background screening values, as presented in Table 5-3.

Metals. Fourteen metals were detected in the groundwater sample collected at the Former Fuel Yard, Parcel 131(7). Antimony, iron, and manganese concentrations exceeded residential human health SSSLs; however, the concentrations of these metals were below background screening values.

Volatile Organic Compounds. VOCs were not detected in the groundwater sample collected at the Former Fuel Yard, Parcel 131(7).

Semivolatile Organic Compounds. Di-n-butyl phthalate was detected in the groundwater sample collected at the Former Fuel Yard, Parcel 131(7). The di-n-butyl phthalate concentration was below residential human health SSSLs.

6.0 Summary and Conclusions and Recommendations

IT, under contract with USACE, completed an SI at the Former Fuel Yard, Parcel 131(7), at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the Former Fuel Yard, Parcel 131(7), and, if present, whether the concentrations would present an unacceptable risk to human health or the environment. The SI at the Former Fuel Yard, Parcel 131(7), consisted of the sampling and analyses of three surface soil samples, three subsurface soil samples, and one groundwater sample. In addition, a groundwater monitoring well was installed in the residuum groundwater zone to facilitate groundwater sample collection and provide site-specific geological and hydrogeological characterization information.

The analytical results from the SI indicate that metals, VOCs, and SVOCs were detected in the environmental media sampled. To evaluate whether the detected constituents present an unacceptable risk to human health or the environment, the analytical results were compared to human health SSSLs, ESVs, and background screening values for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the on-going SIs being performed under the BRAC Environmental Restoration Program at FTMC. Additionally, metals results exceeding the SSSLs and ESVs were compared to media-specific background concentrations (SAIC, 1998).

The potential impact to human receptors is expected to be minimal. Aluminum, arsenic, and iron were detected in surface soils at concentrations exceeding residential human health SSSLs but were less than background screening values. Aluminum and iron were detected in subsurface soils at concentrations exceeding residential human health SSSLs and background screening values. However, these metals concentrations were within the range of background concentrations (SAIC, 1998). Antimony, iron, and manganese concentrations in the groundwater sample collected exceeded residential human health SSSLs; however, the concentrations were below background screening values. Given the low concentrations detected and the limited impacted area, the metals detected in surface soils, subsurface soils, and groundwater do not pose an unacceptable risk to human health.

Although several metals were detected in site media at concentrations that exceeded their ESVs, with the exception of selenium, these concentrations were less than background screening values. A comparison of the selenium concentrations of surface soil samples from the Former Fuel Yard,

Parcel 131(7), to the one background sample that contains selenium, indicates that the selenium concentrations from Parcel 131(7), are within the same order of magnitude as background. Substantial ecological habitat is not present at this parcel because of its small size and, thus, the potential threat to ecological receptors is expected to be very low.

Based on the results of the SI, past operations at the Former Fuel Yard, Parcel 131(7), do not appear to have adversely impacted the environment. The metals and organic compounds detected in site media do not pose an unacceptable risk to human health or the environment. Therefore, IT recommends "No Further Action" and unrestricted land reuse at the Former Fuel Yard, Parcel 131(7).

7.0 References

Cloud, P. E., Jr., 1966, ***Bauxite Deposits of the Anniston, Fort Payne, and Ashville Areas, Northeast Alabama***, U. S. Geological Survey Bulletin 1199-O, 35p.

Environmental Science and Engineering, Inc. (ESE), 1998, ***Final Environmental Baseline Survey, Fort McClellan, Alabama***, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, January.

IT Corporation (IT), 2000a, ***Final Installation-Wide Sampling and Analysis Plan, Fort McClellan, Calhoun County, Alabama***, March.

IT Corporation (IT), 2000b, ***Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama***, July.

IT Corporation (IT), 1998a, ***Final Site-Specific Field Sampling Plan Attachment Site Investigation at the Former Fuel Yard, Parcel 131(7), Fort McClellan, Calhoun County, Alabama***, November.

IT Corporation (IT), 1998b, ***Final Installation-Wide Work Plan, Fort McClellan, Calhoun County, Alabama***, October.

Moser, P. H. and S.S. DeJarnette, 1992, ***Groundwater Availability in Calhoun County, Alabama***, Geological Survey of Alabama Special Map 228.

Osborne, W. E., 1999, Personal Communication with John Hofer, IT Corporation.

Osborne, W. E., and Szabo, M. W., 1984, ***Stratigraphy and Structure of the Jacksonville Fault, Calhoun County, Alabama***, Alabama Geological Survey Circular 117.

Osborne, W. E., Irving, G. D., and Ward, W. E., 1997, ***Geologic Map of the Anniston 7.5' Quadrangle, Calhoun County, Alabama***, Alabama Geologic Survey Preliminary Map, 1 sheet.

Osborne, W. E., Szabo, M. W., Copeland, C. W. Jr., and Neathery, T. L., 1989, ***Geologic Map of Alabama***, Alabama Geologic Survey Special Map 221, scale 1:500,000, 1 sheet.

Science Applications International Corporation (SAIC), 1998, ***Final Background Metals Survey Report, Fort McClellan, Anniston, Alabama***, July.

Szabo, M. W., Osborne, W. E., Copeland, C. W., Jr., and Neathery, T. L., compilers, 1988, ***Geologic Map of Alabama***, Alabama Geological Survey Special Map 220, scale 1:250,000, 5 sheets.

U.S. Army Corps of Engineers (USACE), 1994, ***Requirements for the Preparation of Sampling and Analysis Plans***, Engineer Manual EM 200-1-3, September 1.

U.S. Department of Agriculture (USDA), 1961, ***Soil Survey, Calhoun County, Alabama,*** Soil Conservation Service, Series 1958, No. 9, September

U.S. Environmental Protection Agency (EPA), 1990, ***Installation Assessment, Army Closure Program, Fort McClellan, Anniston, Alabama (TS-PIC-89334)***, Environmental Photographic Interpretation Center (EPIC), Environmental Monitoring Systems Laboratory.

Warman, J. C, and Causey, L. V., 1962, ***Geology and Ground-water Resources of Calhoun County, Alabama,*** Alabama Geological Survey County Report 7, 77 p.

ATTACHMENT I

LIST OF ABBREVIATIONS AND ACRONYMS

APPENDIX A

SAMPLE COLLECTION LOGS AND ANALYSIS REQUEST/CHAIN-OF-CUSTODY RECORDS

APPENDIX B

BORING LOGS AND WELL LOGS

APPENDIX C

WELL DEVELOPMENT LOGS

APPENDIX D

SURVEY DATA

APPENDIX E

SUMMARY OF VALIDATED ANALYTICAL DATA

APPENDIX F

DATA VALIDATION SUMMARY REPORT

APPENDIX G

VARIANCES

APPENDIX H

SUMMARY STATISTICS FOR BACKGROUND MEDIA, FORT MCCLELLAN, ALABAMA